SPAWAR Systems Center San Diego

ROBOTICS UPDATE

"Providing network-integrated robotic solutions for C4ISR applications."

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ROBOTICS ON THE BATTLEFIELD!

For over 30 years, it's been speculated upon, debated, talked up, written about, argued over, simulated, and to some extent even attempted. The US government has spent billions of dollars over this same time frame on a variety of developmental projects, with mixed results, but the much-heralded advent of robotic systems saving human lives on the battlefield has remained stubbornly elusive. Until this year, that is, when user acceptance finally turned the corner in a big way: man-portable explosive-ordnance-disposal (EOD) robots from five commercial vendors were introduced in large quantities to help counter the number one threat facing our forces in theater today, the improvised explosive device (IED). And the verdict so far? "We don't want to go on a mission without our robot."

ET2 Ferreira (l), EMC Hoover, and MAJ Cline at the sand-bagged repair shop.

One of the key individuals whose selfless contributions have played a pivotal role in this historic success is Major Todd Cline, US Army, now Assistant Program Manager for the Armored Security Vehicle at TACOM in Warren, MI. During his previous assignment to the Robotic Systems Joint Project Office (RS JPO), Huntsville, AL, Major Cline made five deployments to Kuwait, Bosnia, and Iraq to familiarize troops in theater with the latest in robotic hardware, and solicit critical user feedback. Demonstrations in early 2003 to the Combined Joint Task Force - Consequence Management in Kuwait included a *MATILDA* platform equipped with a Chemical and Hazardous Avoidance Robotic System (CHARS), initially developed by Space and Naval Warfare Systems Center (SSC) San Diego for the US Army Chemical School at Ft. Leonard Wood, MO. Subsequent to these demonstrations, the Army's XVIII Airborne Corps at Fort Bragg, NC, requested robotically deployed chemical and radiological sensors to search for potentially hazardous agents in Iraq. SSC San Diego quickly issued a contract to iRobot to build four CHARS payloads for the *PackBot*, which were deployed in November 2003 for issue to the 82nd Airborne Division.

Bomb damage incurred on a Foster Miller *Talon* used by EOD technicians in-theater.

***PackBot Scout* equipped with fiber optic and CHARS payloads.**

In February 2004, Major Cline again led the charge to support the PMS-EOD SKISKY fielding of robots to Army, Navy, Marine, and Air Force units in support of CJTF-7. Systems deployed included the Mesa Associates *MATILDA*, the iRobot *PackBot*, the Foster Miller *Talon*, the Northrop Grumman *Mini-Andros II*, and the Canadian-based EOD Performance *Vanguard*. To expedite procurement, multiple contracts were awarded in coordinated fashion by the Technical Support Working Group (TSWG), RS JPO, and SSC San Diego.

EMC Hoover (l) and ET2 Ferreira repair damaged robots in theater.

At the request of RS JPO, SSC San Diego supported the SKISKY effort with the deployment of two Navy Reservists from the Robotic Systems Combat Support Platoon to provide in-theater maintenance in Iraq. The Robotic Systems Combat Support Platoon is the deploying element of the Unmanned Systems Reserve Unit, conceived by LCDR Gordon Hunt, a Reserve Engineering Duty Officer assigned to SSC San Diego. The unit is staffed by highly skilled Navy Reservists, who typically work as engineers and/or electronic technicians in their civilian lives. The Reservists serve two primary

ROBOTICS ON THE BATTLEFIELD! (continued)

roles: to provide robot operator training for deploying EOD teams, and to provide in-theater maintenance and repair for deployed robotic systems. To date, the Reservists have performed training for EOD technicians from the 1st Marine Expeditionary Force (IMEF), Navy EOD Training and Evaluation Unit One, and several Navy EOD Mobile Units.

Navy EOD technician in bomb suit evaluating Segway *HT.*

In April 2004, EMC Thomas Hoover led the first Reserve team into Iraq, accompanied by ET2 Jose Ferreira. The two set up shop in a bombed-out garage on former palace grounds, and began the task of repairing a backlog of broken robots.

Shortly thereafter, an e-mail received from ET2 Ferreira clearly underscored the rapid appreciation on the part of the user for the robots' demonstrated ability to save lives:

YN1 Reed (l) and FC2 Lindly repair an EOD Performance *Vanguard*.

"I wish you all could be here and experience the satisfaction in knowing you saved someone's life today. I wish you could see the fear in their eyes when they first walk in knowing that they could walk out with no robot. I wish you could see the smiles and feel the hugs and handshakes after they leave our shop knowing their 'little Timmy' is ALIVE. Alive and well to go down range one more time."

EMC Hoover and ET2 Ferreira were recently relieved on station by YN1 Christina Reed and FC2 Thomas Lindly. Upon return to the states, they provided invaluable first-hand feedback in the form of lessons learned, observed equipment failure modes, and requested upgrades to the various COTS systems. Major Cline and EMC Hoover also presented highlights of their experiences in June at the Joint Robotics Program (JRP) Working Group Meeting, Quantico Marine Corps Air Station, VA.

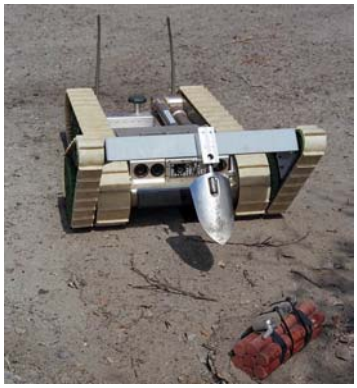
EMC Hoover (l) recounting in-theater experiences to Jon Moneyhun (PM-FPS Rep), Bart Everett, and LTCOL Reed Young (PM-RUS).

One of the most requested upgrades was the ability to dig up and expose IEDs that were being buried for concealment alongside the roadways. Users found that attempts to excavate them using the standard robotic manipulators were understandably causing premature failures. Erin Wickstrand, a mechanical engineering summer intern from the University of Southern California, was assigned the task of designing an inexpensive field-upgrade solution. Her resulting prototype, inspired by a suggestion from iRobot engineers, was a remarkably versatile Quick-Disconnect Toolbar that simply attaches to the *PackBot* flippers, and thus requires no software changes to the robot or its associated OCU.

Bart Everett demonstrating the Common OCU to LTCOL Young (PM-RUS) and Jon Moneyhun.

Erin Wickstrand explaining her Quick-Disconnect Toolbar to Navy EOD technicians.

An assortment of specialty tools (i.e., trowel, pick, rake, wire cutter) can be inserted into the holding fixture in a variety of orientations, secured in place with a single retaining pin. Initial feedback from Navy and Marine Corps EOD technicians training at SSC San Diego has been overwhelmingly positive, and plans are underway to furnish ten evaluation kits to the 63rd Ordnance Battalion in Iraq for further evaluation.



***PackBot Scout* uses trowel attachment on Toolbar.**

At press, over 150 small UGVs have been deployed to Iraq under the SKISKY EOD fielding effort, and a follow-on procurement of additional systems is in progress. Cliff Hudson, JRP Coordinator states: "We're really seeing acceptance of unmanned ground systems because of the standoff capability they give soldiers" when a potential threat is encountered.

While the actual specifics are not for public release, approximately 130 robots have been returned to service so far. At an average procurement cost of $100K per unit, this represents a significant monetary savings. The real return on investment, however, has been the number of lives saved because of the standoff capability these robots can provide.♦

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